

Response to Arguments

This Office Action is responsive to arguments filed on 2/25/2008. Claims 1-12 and 14-16 are pending. Claims 14-16 are withdrawn from further consideration as being drawn to a non-elected invention. Applicant's arguments have been considered and are not persuasive. Thus, claims 1-12 are finally rejected for reasons of record.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4 and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Naoki (JP 11-273731).

Naoki discloses a lithium ion secondary battery comprising a positive electrode including a material that is capable of reversible intercalation/deintercalation of lithium ions as a positive material (particularly LiCoO_2 , LiMn_2O_4 , LiNiO_2), a negative electrode including a material capable of reversible intercalation/deintercalation of lithium ions as a negative material, a separator interposed between the positive and negative electrodes, and an electrolyte on the separator wherein the electrolyte includes a non-aqueous organic solvent, a lithium salt, and a linear polymer having P=O bonds (Abstract and [0028, 0029, 0031, 0033]). (Applicant's claim 1)

Naoki discloses using non-aqueous organic solvents comprising cyclic and linear carbonates, such as ethylene carbonate (EC), propylene carbonate (PC), dimethyl

carbonate (DMC), methylethyl carbonate (MEC), diethylene carbonate (DEC) [0028].

(Applicant's claims 2-4)

Naoki discloses lithium salts comprising LiPF_6 , LiBF_4 , LiClO_4 , $\text{LiN}(\text{SO}_2\text{CF}_3)_2$, $\text{LiC}(\text{SO}_2\text{CF}_3)_3$ in the amount of between 1M and 1.7M [0029]. (Applicant's claims 9 and 10)

Naoki discloses wherein the electrolyte includes a polymerized phosphoric ester, as illustrated as formula. 3.

The amount of the phosphoric ester polymer is 5 vol%. Naoki discloses that the phosphoric ester polymer is 5 vol% and not wt%. Naoki does not disclose the density of the polymer to define a wt% of polymer in the electrolyte (applicant's claim 1). The Office notes that the density of most materials is about 1g/ml and thus, vol% is approximately weight %. It has been held that a prima facie case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). See MPEP 2144.05.

Regarding claim 11, it has been considered but was not given patentable weight because the courts have held that the method of forming the product is not germane to the issue of patentability of the product itself. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious

from the product of prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). See MPEP 2113. Once the examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product. *In re Marosi*, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir.1983).

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Naoki (JP 11-273731) as applied to claim 11 in view of Yeager (US 2002/0177027).

Naoki discloses all the elements of claim 11 and is incorporated herein. Naoki does not disclose wherein the electrolyte includes a phosphonate as claimed in claim 12. However, Yeager discloses that dialkylvinylphosphonates, such as diethylvinylphosphonate ([0071], lines 11-12 from the bottom) are used as flame retardants. It is commonly known in the art that thermal instability and explosions are problems with batteries, particularly Li ion batteries, as disclosed by Naoki [0003]. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to polymerize dialkylvinylphosphonates instead of a phosphoric ester for the benefit of reducing explosions and thus, making a safer Li ion battery. Considering the limited number of species in the class of dialkylvinylphosphonates, it is found that

dimethylvinylphosphonate and dipropylvinylphosphonate are obvious for the same reason given above.

Claims 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Naoki (JP 11-273731) as applied to claim 1 in view of Tsutsumi (US 6645671).

Naoki discloses a lithium ion secondary battery comprising a positive electrode including a material that is capable of reversible intercalation/deintercalation of lithium ions as a positive material (particularly LiCoO_2 , LiMn_2O_4 , LiNiO_2), a negative electrode including a material capable of reversible intercalation/deintercalation of lithium ions as a negative material, a separator interposed between the positive and negative electrodes, and an electrolyte on the separator wherein the electrolyte includes a non-aqueous organic solvent, a lithium salt, and a linear polymer having $\text{P}=\text{O}$ bonds (Abstract and [0028, 0029, 0031, 0033]). (Applicant's claim 1)

Naoki discloses of using a phosphoric ester polymer in the electrolyte solution, see Fig. 3.

The amount of the phosphoric ester polymer is 5 vol%. Naoki discloses that the phosphoric ester polymer is 5 vol% and not wt%. Naoki does not disclose the density of the polymer to define a wt% of polymer in the electrolyte (applicant's claim 1). The Office notes that the density of most materials is about 1g/ml and thus, vol% is approximately weight %. It has been held that a prima facie case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. Titanium

Metals Corp. of America v. Banner, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). See MPEP 2144.05.

Naoki discloses using non-aqueous organic solvents comprising carbonates, such as ethylene carbonate (EC), propylene carbonate (PC), dimethyl carbonate (DMC), methylethyl carbonate (MEC), diethylene carbonate (DEC) [0028]. (Applicant's claims 2-4) and does not disclose that the non-aqueous solvent comprises a mixed solvent of a carbonate solvent and an aromatic hydrocarbon solvent (applicant's claims 5-8). However, Tsutsumi discloses of using a combination of high-permittivity solvent and a low-viscosity solvent for the benefit of obtaining high charging/discharging efficiency, as well as to keep the viscosity low. Examples of high-permittivity solvents include cyclic carbonates (7:1-8). Examples of aromatic hydrocarbons include benzene, toluene, and xylene, as low-viscosity solvents (7:1-25). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to add an aromatic hydrocarbon, such as benzene, toluene, and xylene to Naoki's Li ion battery for the benefit of reducing the electrolyte viscosity.

Tsutsumi discloses of using the high-permittivity solvents and low viscosity solvents in a volume ratio of preferable 1:4 to 2:1, preferably 1:2 to 1:1 (7:40-45). Carbonate solvent is a high permittivity solvent and aromatic hydrocarbon is a low viscosity solvent and it has been held by the courts that discovering an optimum value or workable ranges of a result-effective variable involves only routine skill in the art, and thus not novel. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). See MPEP 2144.05.

Response to Arguments

Applicant's arguments filed 2/25/2008 have been fully considered but they are not persuasive.

Applicant asserts that Naoki does not establish a prima facie case of obviousness, because Applicant asserts that claimed range and prior art range would not have the same properties because the instant disclosure pg 9, lines 7-8 disclose that the battery performance deteriorates when the polymer exists in the amount exceeding 5%.

It is noted that it has been held that a prima facie case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties (emphasis added). *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). See MPEP 2144.05. The Examiner notes that Naoki's 5% is close enough to Applicant's "less than 5%", such as 4.99%, that they would possess similar properties. The Examiner further points out that the battery performance deteriorates when the polymer exists in the amount exceeding 5%, and not at 5% (emphasis added).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cynthia Lee whose telephone number is 571-272-8699. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1795

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ckl

Cynthia Lee

Patent Examiner

/PATRICK RYAN/

Supervisory Patent Examiner, Art Unit 1795